CHAPTER 1
Introduction

BACKGROUND

In 1999, Jeff Herr developed the original Glades Okeechobee Highlands (GOH) Model. This model was included as Appendix H of the 2000 Kissimmee Basin Water Supply Plan. The current model, called the Lower Kissimmee Basin Groundwater Model (LKBGWM) is a revision of the Glades Okeechobee and Highlands Model. The steady-state, three-dimensional groundwater flow model was developed to simulate the Upper and Middle Floridan aquifers underlying the southern Kissimmee River Basin. In this version of the model, the Surficial Aquifer System was activated, so lakes, rivers (and canals), drains, evapotranspiration and recharge files were added. Many of the model input files were revised using data and/or processing methods that were not available in the earlier version of the model. The hydrostratigraphy was redefined using more sampling points. The Upper Floridan Aquifer was divided into two layers the Upper Floridan Aquifer and the Middle Floridan Aquifer with a confining unit between the two aquifers. The current version of the model was calibrated using 1995 land use, 1995 water level information and 2003 permitted water use (the assumption was made that there was not a significant change in permitted water use in these years). The calibrated model will be used to evaluate the effects of projected water use estimates in 2025. Water supply managers evaluate urban and agricultural water uses and must ensure current and future reasonable beneficial uses, while protecting and restoring the environment and water resources.

This model is a revision of the 1999 Glades Okeechobee and Highlands Model for this area. The 1999 Glades Okeechobee and Highlands Model was a steady-state model. The Surficial Aquifer System was not active in that version of the model, but held at steady-state. In addition to the Glades Okeechobee and Highlands Model, several other studies were done in portions of the model area and in regional studies, which included this model area. Sepulveda (2002) conducted a regional model using the results of most of the Intermediate and Floridan Aquifer groundwater modeling in peninsular Florida. The groundwater flows in Lake Wales Ridge area, were simulated by Yobbi (1996). Southwest Florida Water Management District (SWFWMD) (2002) conducted a study of saltwater intrusion in the southern water use caution area. Southwest Florida Water Management District Southern District Groundwater Flow Model included Lake Wales Ridge area near the boundaries of their model.

OBJECTIVES

The Lower Kissimmee Basin Groundwater Model was developed to provide support for the South Florida Water Management District's (SFWMD's) comprehensive regional water supply plan for the Kissimmee Basin (**Figure 1**). The purpose of the Lower Kissimmee Basin Groundwater Model is to be used as a tool to estimate the impact of changing water supply demands on the hydrologic systems of the basin.

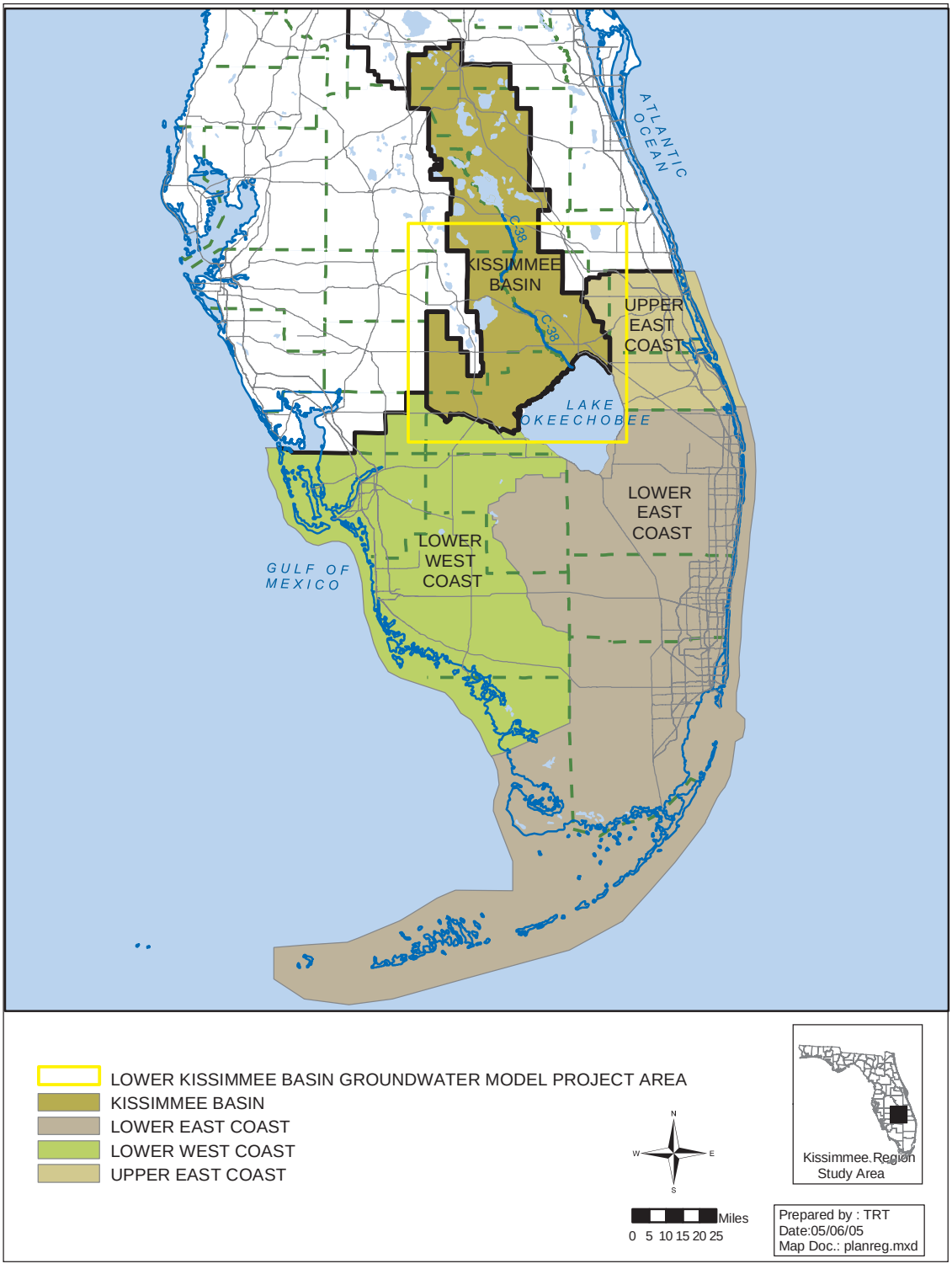

Figure 1. SFWMD Water Supply Planning Regions.

In order to achieve this goal, the steady-state conditions for 1995 were simulated by calibrating the model to 1995 stress conditions. The calibrated model can be used as a tool to predict impacts of future changes in land use and consumptive use on the water levels in the Surficial Aquifer System and Floridan Aquifer System. The calibrated model will be used to show the effects of projected water use estimates in 2025.

The Lower Kissimmee Basin Groundwater Model (**Figure 2**) includes all of Okeechobee and Highlands counties and most of Glades County. It also includes portions of Polk, Osceola, Indian River, St Lucie, Martin, Palm Beach, Charlotte, DeSoto and Hardee counties

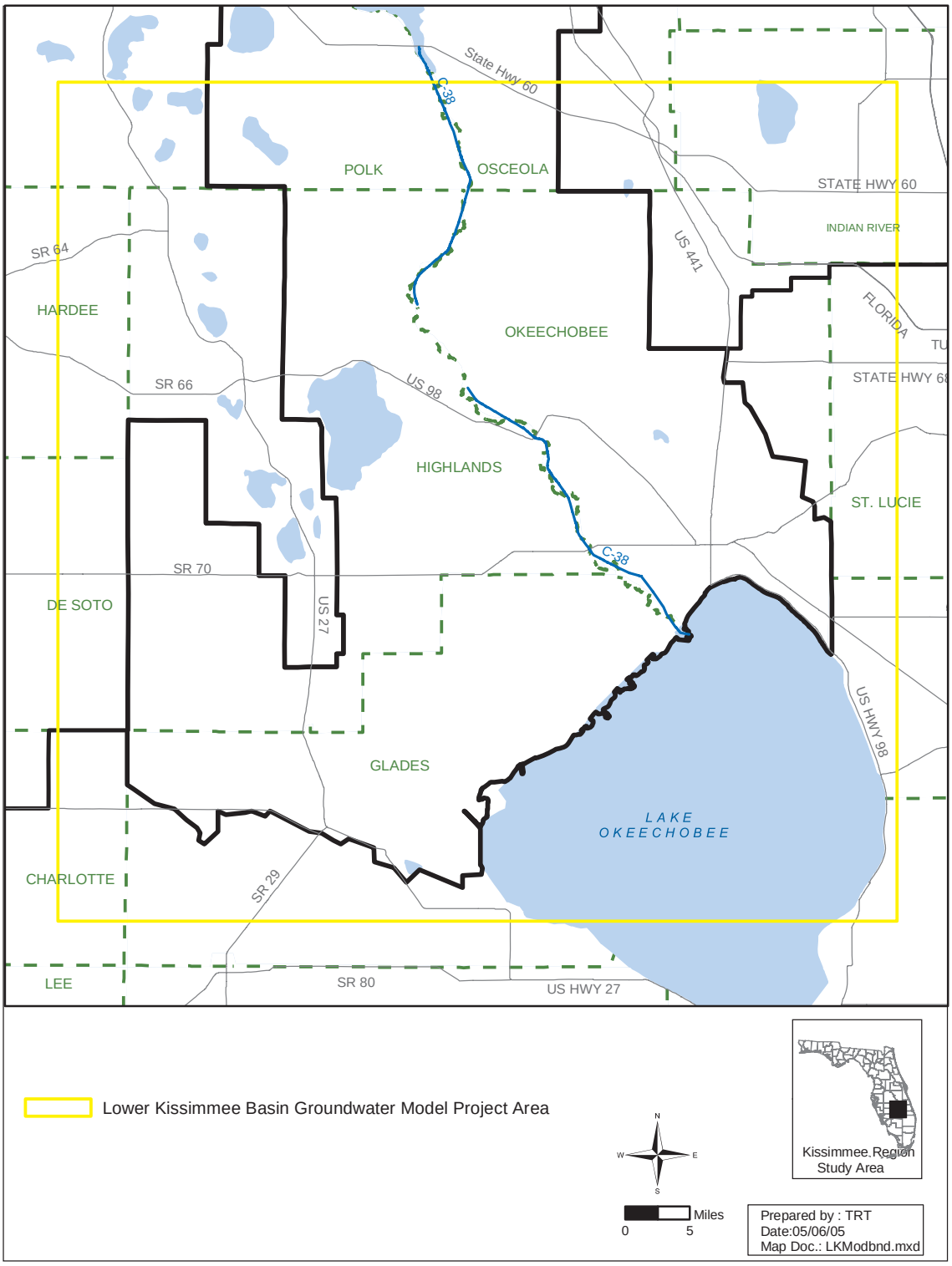

Figure 2. Lower Kissimmee Basin Groundwater Model Project Area.

With these objectives in mind, the scope of this document covers the development of the model in its entirety. **Chapter 1** introduces the purpose and scope of this study, and lists previous modeling studies done for the Lower Kissimmee Basin. **Chapter 2** reviews the geomorphology in the model area. **Chapter 3** reviews the hydrogeologic system in the model area. Simulating the flow system involves two aspects – code selection and model design, which are discussed in **Chapter 4**. **Chapter 5** details the processes of model calibration and verification. The focus is on reporting model results and sensitive model parameters.

A standard modeling protocol requires completing the steps in **Chapters 3**, **4** and **5** (Anderson and Woessner 1992). With model development complete, the next section of this document describes the performance of this model and its use in predictive applications. Conclusions and recommendations with respect to model capabilities and future improvements of this modeling study are given in **Chapter 6. Appendix D** describes the application of this model for use with predictive simulations.

DATA SOURCES

The hydrologic, meteorologic and lithologic data used for this project were collected from the following databases: South Florida Water Management District (DBHYDRO)[1] and Regulations, St. Johns Water Management District (SJRWMD)[2], Southwest Florida Water Management District (SWFWMD)[3] and U.S. Geological Survey (USGS)[4]. In addition, lake information was obtained from Web sites: IFAS LAKEWATCH[5] and Highlands[6] and Polk counties[7].

[1] SFWMD DBHYDRO http://www.sfwmd.gov/site/index.php?id=38

[2] SJRWMD http://www.sjrwmd.com/programs/data.html

[3] SWFWMD http://www.swfwmd.state.fl.us/data/

[4] USGS National Water Information System http://nwis.waterdata.usgs.gov/usa/nwis/

[5] LAKEWATCH http://lakewatch.ifas.ufl.edu/

[6] Highlands County http://www.highlandsswcd.org/

[7] Polk County http://www.polk.wateratlas.usf.edu/navigator/